

GUIDELINES FOR PILOTS

SEEKING ALL-ATTITUDE TRAINING

The following is intended as a general guide only. The layout is similar to that of an Advisory Circular.

HOW TO EVALUATE SPIN, EMERGENCY MANEUVER, UPSET RECOVERY, LOSS OF CONTROL, AND AEROBATIC TRAINING PROGRAMS

1. Purpose. This information is primarily for pilots who are interested in receiving training in spins, emergency maneuvers, upset recoveries, loss of control, and aerobatics (collectively, all-attitude training). It also provides guidance to those who provide such training. Since most all-attitude training is typically conducted in aircraft approved for acrobatic flight, relevant regulations and airworthiness standards are reviewed as well.

2. Related Reading Material. The following documents are available online at <http://www.faa.gov>:

1. AC 61-67C, *Stall and Spin Awareness Training*
2. AC 90-23F, *Aircraft Wake Turbulence*
3. AC 91-51A, *Effect of Icing on Aircraft Control and Airplane Deice and Anti-Ice Systems* (see Appendix 1. Roll Upset)
4. AC 91-61, *A Hazard in Aerobatics: Effects of G-Forces on Pilots*

3. Background. The last decade has seen a renewed emphasis on all-attitude training at all levels, from general aviation through transport category operations. Improved training materials have become available as well as new training aircraft approved for intentional spins and other aerobatic maneuvers. In an effort to enhance safety in this unique and still relatively unregulated environment, some basic guidelines for general aviation pilots are warranted.

4. Definitions.

Aerobatics/Acrobatcs. FAR 91.303 defines aerobatic flight as *an intentional maneuver involving an abrupt change in an aircraft's attitude, an abnormal attitude, or abnormal acceleration, not necessary for normal flight.*

Aerobatic flight is often mistakenly assumed to occur only when an aircraft exceeds 30 degrees of pitch or 60 degrees of bank relative to the

horizon; the definition of aerobatic flight, however, does not specify pitch attitude or bank angle. The 30/60 rule, which appears in FAR 91.307 (c), specifies the conditions under which parachutes must be worn by occupants of an aircraft. In the classical sense, the term *aerobatics* includes spinning, looping, and rolling an aircraft through 360 degrees of yaw, pitch, and roll.

AFM/POH. Refers to the approved Airplane Flight Manual or Pilot Operating Handbook.

FAA, FAASTeam. Federal Aviation Administration, FAA Safety Team.

FAR. In an aviation context, the Code of Federal Regulations (specifically 14 CFR Parts 61 and 91) is more commonly referred to as Federal Aviation Regulations or FARs.

FOD. Foreign Object Damage. Unsecured items in the cockpit can cause damage, injury, or jammed controls.

IAC. International Aerobatic Club.

Load Factor. Also referred to as g-load. Load factor is the ratio of wing lift to the total weight of an aircraft ($G = L/W$). Positive Gs press the pilot more firmly into the seat; negative Gs push the pilot out of the seat.

LOC. Loss of Control, which refers to aircraft accidents resulting from situations in which the pilot should have maintained or regained aircraft control, but did not. LOC is divided into two types: Loss of Control-Ground (LOC-G), and Loss of Control-Inflight (LOC-I).

SAFE. Society of Aviation and Flight Educators.

5. General Considerations. All-attitude training is a highly specialized field of endeavor, commanding the same attention to detail and professionalism as other forms of flight training. For instance, just as it would be imprudent to fly in the clouds in an aircraft not equipped to handle flight in instrument meteorological conditions, it would be

equally imprudent to attempt spin training in an aircraft in which intentional spins are not approved, or with an instructor who has minimal experience spinning a particular model.

Since regulations tend to allow considerable latitude in the case of all-attitude instruction, the aviation consumer—you—must apply your own set of standards in your quest to find quality training. Although these guidelines do not guarantee competent, safe instruction, they should equip you with some of the information needed to assess the services offered by various operators and make an informed decision.

6. Evaluating The School. Finding a good school is where the process begins. An excellent starting point is the IAC, which not only publishes an online directory of aerobatic schools, but also has decades of experience compiling information on subjects ranging from competitive aerobatics, to human factors, to technical problems affecting aerobatic aircraft. Also watch for magazine articles highlighting aerobatic schools and talk to other pilots about their experiences.

If possible, visit the prospective school and take note of its atmosphere. The size of the operation is not important; what is important is the attitude of those working there. Find out what teaching aids are used in the classroom, and ask for recommendations on related reference materials. Find out if the school specializes in the training sought and request a list of former students. Ultimately, you should feel comfortable with the surroundings and confident in the school's ability to provide the training services you seek.

7. Evaluating The Program. For many reasons, aerobatic schools tend to be logical sources for all-attitude training. Bear in mind, however, that aerobatic capability itself is not necessarily a good indicator of the wherewithal to provide training in the context of emergency maneuvers. Teaching precision aerobatics is not the same as teaching pilots to recognize the warning signs that precede common accidents, or how to recover from loss of control scenarios.

One of the earmarks of a quality all-attitude program—be it a Part 61 or Part 141 operation—is the existence of a training syllabus. Schools that specialize will be able to present a clear plan of action. You certainly cannot earn a pilot's certificate or an instrument rating without comprehensive ground instruction coupled with hands-on experience. The same is true with all-attitude training. A thorough briefing before each flight is a must (the cockpit is a lousy classroom). Be wary if ground instruction only occurs during the stroll out to the airplane, or if the training philosophy is that you'll learn all you need to know in the air.

Besides being exhilarating, the training should improve your knowledge and experience base, stick and rudder skills, and situational awareness. It is not an iron man competition to see how many Gs can be pulled. Also, it is a rare individual indeed who can tolerate a full hour of this training. Forty-five minutes or so per flight is more realistic. It is also reasonable to expect the following from various programs:

Spin Training: A primary spin course can be accomplished in an environment of +0.5 to +2.5 Gs. At a minimum, expect to review the material in AC 61-67C along with stalls and one-turn spins. A review of stall/spin accident scenarios coupled with recoveries from unusual attitudes is an excellent idea, too.

Emergency Maneuver/Upset Recovery/LOC Training: These programs can be accomplished from -1.0 to +4.0 Gs, perhaps less (routinely experiencing more Gs than this is unnecessary). At a minimum, expect to cover the same material as in a spin training program plus rolls and rolling upset scenarios. In-flight emergencies such as control failures and off-airport landing simulations may also be included.

Aerobatics: Basic aerobatics can be accomplished from -1.0 to +4.0 Gs, perhaps less (again, routinely experiencing more Gs than this is unnecessary). At a minimum, expect to cover spins, rolls, loops, and combination maneuvers such as the

half loop-half roll and the hammerhead. Inverted turns and inverted spins may be included as well. It is wise to insist on recoveries from botched aerobatic maneuvers, too.

8. Evaluating The Instructor. The requirements necessary to earn various certificates and ratings are listed in FAR Part 61. Additionally, Part 61 addresses minimum requirements and logbook endorsements needed to tow gliders or act as pilots-in-command of tailwheel aircraft. Yet no separate certificate, rating, or endorsement is required to specifically qualify an individual as an all-attitude instructor.

However, flight instructor applicants are required to receive a spin endorsement certifying that they are "competent and proficient" in spin training instructional skills. But as several studies have shown, flight instructors in general do not possess either the detailed knowledge or the hands-on experience to conduct spin training safely and purposefully.

Anyone claiming to be an all-attitude instructor must at least hold a valid Commercial certificate if working for compensation or hire. The instructor must also be a certificated flight instructor (CFI) to provide FAA endorsements. Other than that, CFI credentials are not necessary for anyone to claim to be an all-attitude instructor. Therefore, *caveat emptor*—buyer beware—applies when seeking instruction.

A number of voluntary continuing education programs exist for instructors who wish to advance their professional development, including:

- FAA WINGS Program
- IAC Aerobatic Achievement Awards Program
- SAFE Aviation Educator Mentoring Program
- Master Instructors LLC
 - Aerobatic Instructor Designation Program
 - CFI Professional Accreditation Program
 - Master Instructor Continuing Education Program

As is true with other forms of flight training, the all-attitude instructor is the vital link in the learning process. The instructor will be coaxing you through some exciting and unusual attitudes. You may be exposing your innermost fears to this person, and you will be placing your life into the instructor's hands. Ask about the instructor's background. Ascertain whether the instructor specializes in all-attitude training, or if it is merely a passing interest. Moreover, if you do not develop a good rapport with the instructor, do not hesitate to request another one, or to look elsewhere.

Good instructors will tailor their style to match your abilities and needs. Professional instructors will instill confidence, will treat you as an equal, and will be sensitive to your physiological make-up. Expect to do the bulk of the flying yourself—after all, that is why you have signed up for this training. The instructor's job is to coach you through various maneuvers and procedures, not to impress you with his or her flying prowess.

When interviewing potential instructors, consider these questions:

- Is the instructor a CFI?
- Does the instructor participate in continuing education programs?
- Does the instructor specialize?
- Does the instructor belong to IAC, SAFE, or other organizations?
- Is the instructor involved with the FAASTeam?

9. The Training Aircraft. Unless certain special provisions are met, FAR 91.319 prohibits the use of experimental aircraft for compensation or hire. All-attitude training for hire may only be offered in certificated, production aircraft; owners of experimental aircraft, however, may receive dual instruction in their aircraft.

It is imperative to restrict your maneuvers only to those clearly approved in the AFM/POH. Intentional spins, for example, are only approved when operating in the Acrobatic category (notwithstanding ADs or STCs that may have altered the airplane's spin certification). In some

cases, intentional spins may be approved when operating in the Utility category (consult the AFM/POH). And intentional spins are never approved when operating in the Normal category.

Other approved aerobatic maneuvers must be reserved for airplanes designed to handle the rigors of aerobatic flight. The minimum structural design limits of +6.0 and -3.0 Gs required of aircraft operated in the acrobatic category afford a sufficient margin of safety above the loads typically imposed during all-attitude training. The training airplanes should be well maintained and must be operated within their prescribed weight and balance limits.

Preflighting an aerobatic airplane is not all that different from a non-aerobatic airplane. Follow the procedures in the AFM/POH, paying special attention to points of connection, the engine compartment, and control surfaces. Wrinkling or deformations in the airplane's skin should be questioned. Maintaining a sterile cockpit and baggage area is important to the safety of all-attitude training flights. Reduce FOD by securing items such as fuel strainers and manuals. If possible, shine a flashlight down the fuselage behind the seats. Look for misplaced tools and other foreign objects everywhere you can. Also, dirt on the cockpit floor could get in your eyes during low-g or inverted flight. Be sure to leave loose change, keys, pens, cell phones, and unsecured cameras in the classroom.

Some trainers have a redundant set of seatbelts for aerobatic flight. Learn how to adjust the belts properly and how to operate the buckles.

Emergency egress is an important consideration as well, so inquire about the airplane's egress procedure. The door or canopy on most aerobatic airplanes can be jettisoned by removing a pin and/or pulling or pushing on a clearly marked handle. You may be able to push windows out as well. Rehearse the emergency egress procedure with your instructor.

10. Parachutes. Pursuant to FAR 91.307 (c), approved parachutes are mandatory for flight operations that will exceed 60 degrees of bank or 30 degrees of pitch relative to the horizon. The only exception is spin training. Yet even though parachutes are not required for spin training, it is recommended that they be worn nonetheless, if available.

Many other all-attitude training maneuvers will necessarily exceed 30 degrees of pitch and 60 degrees of bank; therefore, parachutes will be required. Do not enroll in a program if parachutes are not included as standard safety equipment. The parachutes must be inspected and repacked periodically (e.g., within the preceding 180 days if constructed of synthetic materials).

11. The Practice Area. FAR 91.303 stipulates conditions under which aerobatic flight is prohibited. No person may operate an aircraft in aerobatic flight:

- Over any congested area of a city, town, or settlement;
- Over an open air assembly of persons;
- Within the lateral boundaries of the surface areas of Class B, Class C, Class D, or Class E airspace designated for an airport;
- Within 4 nautical miles of the center line of any Federal airway;
- Below an altitude of 1,500 feet above the surface (expect your training to take place between 3,500 and 5,000 feet AGL or higher); or
- When flight visibility is less than 3 statute miles.

A school nestled in a metropolitan area, or under a complex web of controlled airspace, may need a waiver issued pursuant to 91.903 and 91.905 to conduct the training legally. The waiver lists the specific provision(s) of 91.303 that are being waived, and defines the physical size and location of the aerobatic practice area. The waiver lists altitude limitations, hours in effect, and any special provisions that must be satisfied as well. If you feel your aerobatic training is being

conducted contrary to 91.303, and if the operator cannot produce a waiver for your perusal, it is recommended you switch to another school.

12. The Personal Commitment.

Getting the most out of all-attitude training is a two-way street. You can select a good school, with an excellent instructor, using the best equipment money can buy. It is up to you, however, to be committed to learn. Review your class notes. Take time to mentally rehearse maneuvers and procedures at home before your next flight. Go to the lessons armed with questions and interact with your instructor.

Basic programs can typically be as short as three hours, or as long as ten. In any case, it is important to pace yourself until the program is completed. Fly a minimum of once a week. More often is better, but no more than twice a day. This training is as mentally taxing as it is physically demanding, so allow ample time to rest between flights. Postpone a lesson if you are not feeling well, and cut a lesson short if you start to feel uneasy.

To reduce the risk of airsickness, try to be well rested going into each lesson. Eating in moderation, drinking plenty of fluids, and avoiding junk food immediately before or after flying will minimize airsickness tendencies.

The type of aircraft used, the reputation and geographic location of the school, and the experience of the instructor all influence the cost of all-attitude training. Although the per-hour rate may seem higher when compared to traditional flight training, recognize that you will be gaining a tremendous amount of aeronautical knowledge and practical experience in a compressed amount of time. The techniques learned will improve your other flying skills significantly, and might save your life someday.

Once you select an instructor and a program you are comfortable with, try to relax. You are embarking on a unique flying experience; butterflies are perfectly normal. Focus instead on the techniques being taught. You'll be amazed at how quickly apprehension

dissolves into enjoyment and a desire to perform the maneuvers and procedures well. Above all, you should come away from this training rewarded with enhanced confidence, a deeper appreciation for the flight environment, and a profound respect for the special equipment and piloting skills needed to handle an airplane safely in any attitude.

MEMORY AIDS – SIMPLE STRATEGIES FOR SAFETY DURING ALL-ATTITUDE TRAINING

1. Introduction. The secret behind becoming a proficient pilot can be summed up in three words: practice, practice, practice. Defining the objective, outlining the plan, and repeating quality training scenarios over and over again until they become instinctive are key to maximizing your all-attitude training experience. Continued proficiency, however, requires routinely reviewing the procedures.

Following are some aids that might prove beneficial during your all-attitude training and beyond.

2. Emergency Egress. Having to bail out of an airplane during all-attitude training is an extremely rare event. But just in case, remember the *THREE H's*: Handle, Headset, Harness.

1. Grab the emergency Handle (it is often red, or should be) and jettison the door or canopy. Many aerobatic aircraft have a retaining pin that must be removed first to unlock the handle; then pull or push the handle as required.
2. Remove your Headset and drop it to the side (if you are wearing a helmet, disconnect the headset cord from the airplane).
3. Undo your seatbelt Harness and move the loose ends away from your body.
4. Exit the airplane, headfirst if need be. As soon as you are clear of the airplane, Look at the ripcord handle (the D-shaped ring on your parachute), Grab it with both hands, and Pull!

3. In-Flight Pre-Aerobatic Checks. Remember the *FOUR A's* before commencing maneuvers: Altitude, Articles, Aircraft, Airspace:

1. Be sure you have enough Altitude to begin. Factor in the maneuvers to be flown, your current level of proficiency, and an adequate margin of safety.
2. Verify all loose Articles are secure, which includes windows, doors, canopies, and occupants.
3. Verify the Aircraft is configured properly: mixture, switches, fuel selector, engine instruments, carb heat/alternate air, flaps.
4. Clear the Airspace for other traffic and make sure you are complying either with the provisions of FAR 91.303 or a waiver for the area.

4. Unusual Attitudes. Remember to *RELAX*. Whether encountered intentionally or not, most unusual attitudes are pilot-induced. Continuing to try to force the airplane to fly without enough energy, or at the wrong angle of attack, or with misapplied controls, can quickly lead to an inadvertent stall/spin or unplanned inverted attitude. The airplane will often return to a more normal state if you simply relax your grip on the controls early enough in the loss of control sequence.

Rather than fighting the airplane as it departs controlled flight, abort errant maneuvers early. Aborting will allow you to regain control faster with more options at your disposal.

5. Inadvertent Spins. Whether the spin is intentional or inadvertent, the *PARE*® acronym (pronounced "pair") provides a systematic check as well as optimal sequencing of anti-spin controls in light, single-engine airplanes:

1. Power—Off
2. Ailerons—Neutral (+ flaps "up")
3. Rudder—Full Opposite to the direction of Yaw (hold until rotation stops)
4. Elevator—Neutral

"Elevator—Neutral" is a direction of movement during recovery, not necessarily the final location for the

stick/yoke. Once full opposite rudder has been applied briskly and is being held, proceed by moving the stick/yoke toward neutral elevator. Apply whatever force is required to make the elevator control move. Continue to move the stick/yoke however far beyond neutral it takes for spinning to cease. In some cases, full elevator deflection—all the way to the control stop—will be required. Once spinning ceases, neutralize the rudder before returning to level flight.

Discussions about spin recovery must always be done in the proper context. As the name implies, "NASA Standard Spin Recovery" as elucidated with the *PARE*® acronym is the standard for light, single-engine airplanes. Flight manual or alternative spin recovery recommendations must be considered in the context of the NASA Standard and the airplane in question.

6. Inverted Attitudes. Should you find yourself upside down, or in a steeper bank than you had intended, remember *Power—Push—Roll*:

1. Reduce Power if the nose is below the horizon and airspeed is increasing (e.g., downward spiral); increase power if the nose is above the horizon and speed is decaying, or if you are low and slow (e.g., wake turbulence close to the ground).
2. Apply a slight Push on the stick/yoke to reduce the positive g-load (i.e., unload the wing, reduce AOA).
3. Apply full aileron along with some coordinated rudder to Roll the airplane upright.

Avoid pulling while you are rolling; roll completely upright first, then return the airplane to a level pitch attitude.

7. In-Flight Engine Failure. Recall *Speed—Spot—Set-up*:

Without delay, establish the best glide attitude that corresponds to the best glide Speed. Then select and head toward a suitable landing Spot. If time and altitude permit, Set-up for landing by configuring the airplane according to the AFM/POH.

If landing off-airport, consider opening or even jettisoning the door or canopy prior to touchdown (time and other flying duties permitting) so you can more easily exit the airplane once on the ground.

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ADDITIONAL RESOURCES

Advisory Circulars – www.FAA.gov

Aerobatic Instructor Designation Program – www.MasterInstructors.org

Council on Unusual Attitude Training & Education – www.stallspin.com

FAASTeam – www.FAASafety.gov

IAC – www.IAC.org

SAFE – www.SafePilots.org

Rich Stowell – www.RichStowell.com

Upset Prevention & Recovery Training Association – www.uprta.org



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